

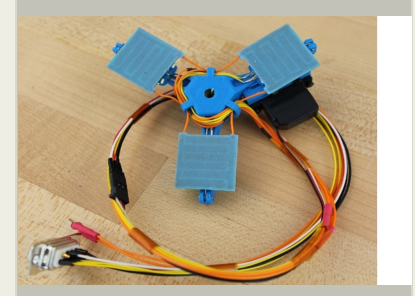
Industrial Electrostatic-Gecko Gripper, Phase I

Completed Technology Project (2015 - 2015)



Project Introduction

Perception Robotics is developing an innovative product, the "Electrostatic Gecko Gripper" (ESG Gripper), for the industrial automation market. This unique gripping solution overcomes the shortcomings of vacuum grippers by eliminating the need for a compressed air system and offering more rapid actuation, thus achieving significant cost savings and throughput improvements in customers' manufacturing processes. The ESG gripper utilizes an adhesive element inspired by gecko feet coupled with an electrostatic adhesive. When the electrostatic and gecko adhesives work together, a positive feedback cycle is created that, depending on surface type, can be greater than the sum of its parts—as the gecko adhesive engages, it brings the electrostatic adhesive closer to the surface, thus increasing its adhesive force; in turn, the electrostatic adhesive helps engage more of the fibrillar stalks of the gecko adhesive. Previous experimental results have shown that the combination adhesive technology can provide up to 5.1x greater adhesion than the electrostatic or gecko-like adhesives alone (Ruffatto, Shah, & Spenko, 2014). The adhesive and grippers have been developed significantly over the last decade, since the first gecko-like adhesives were fabricated in 2003. Based on prior test results of the adhesives and grippers presented here, the ESG Gripper will offer the following benefits: • Ability to affix to a wide variety of industrial surfaces including glass, metals, composites, and painted surfaces; anything from a very smooth to matte finish • Extreme reusability (>30,000 ON-OFF cycles); can remain ON or OFF for > 1 year • High force capability >30 kPa of adhesion on most surfaces; typical normal (adhesion) to shear force ratio is 1:3 (Parness, et al., 2013) • Ultrafast engagement speed: <16ms (Wettels & Parness, 2014) • Adhesive effect is temperature, radiation, and vacuum invariant (Day, Cutkosky, Greco, & McLaughlin, 2011).



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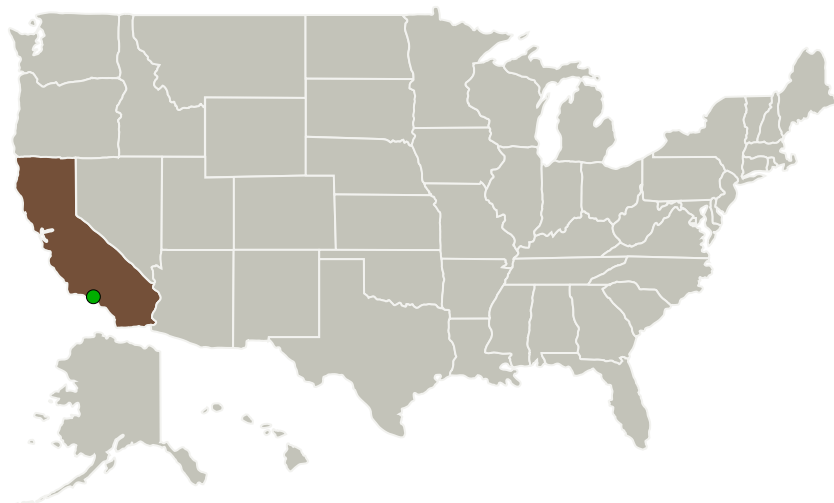
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Somatis Sensor Solutions	Lead Organization	Industry Historically Underutilized Business Zones (HUBZones)	Los Angeles, California
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations

California

Project Transitions

**June 2015:** Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Somatis Sensor Solutions

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Nicholas Wettels

Co-Investigator:

Nicholas Wettels

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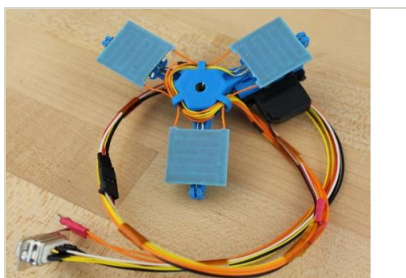
✓ **December 2015:** Closed out

Closeout Summary: Industrial Electrostatic-Gecko Gripper, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/138987>)

Images

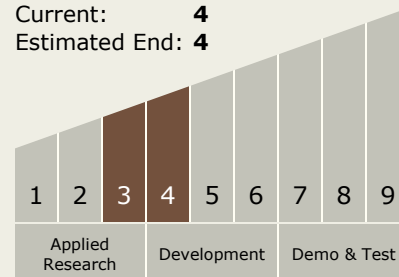


Briefing Chart Image

Industrial Electrostatic-Gecko Gripper, Phase I
(<https://techport.nasa.gov/image/133776>)

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX04 Robotic Systems
 - └ TX04.2 Mobility
 - └ TX04.2.2 Above-Surface Mobility

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System